

WE CLAIM:

1. A method for producing a product having the ability to perform a preselected function on a target comprising:

- 5 (a) preparing a nucleic acid test mixture, wherein said nucleic acid test mixture comprises nucleic acids having one or more functional groups selected from the group consisting of

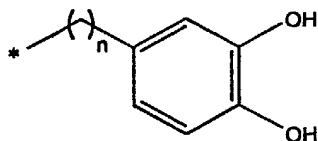
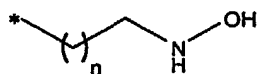
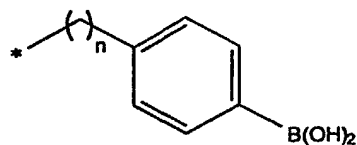
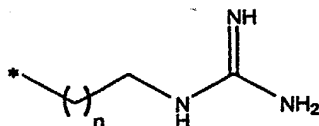
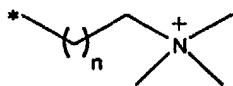
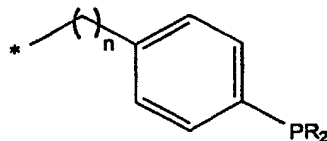
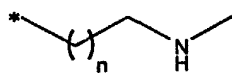
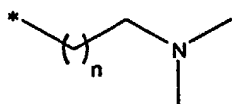
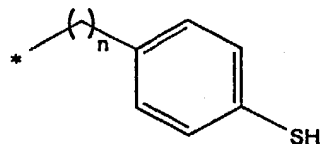
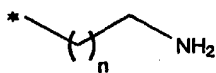
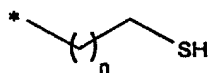
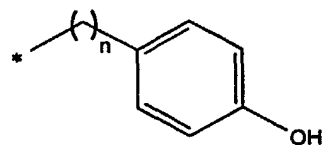
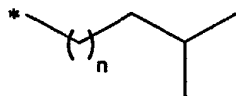
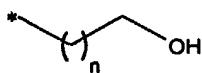
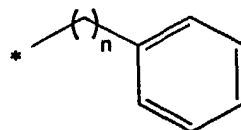
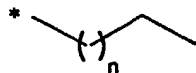
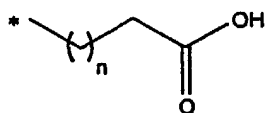
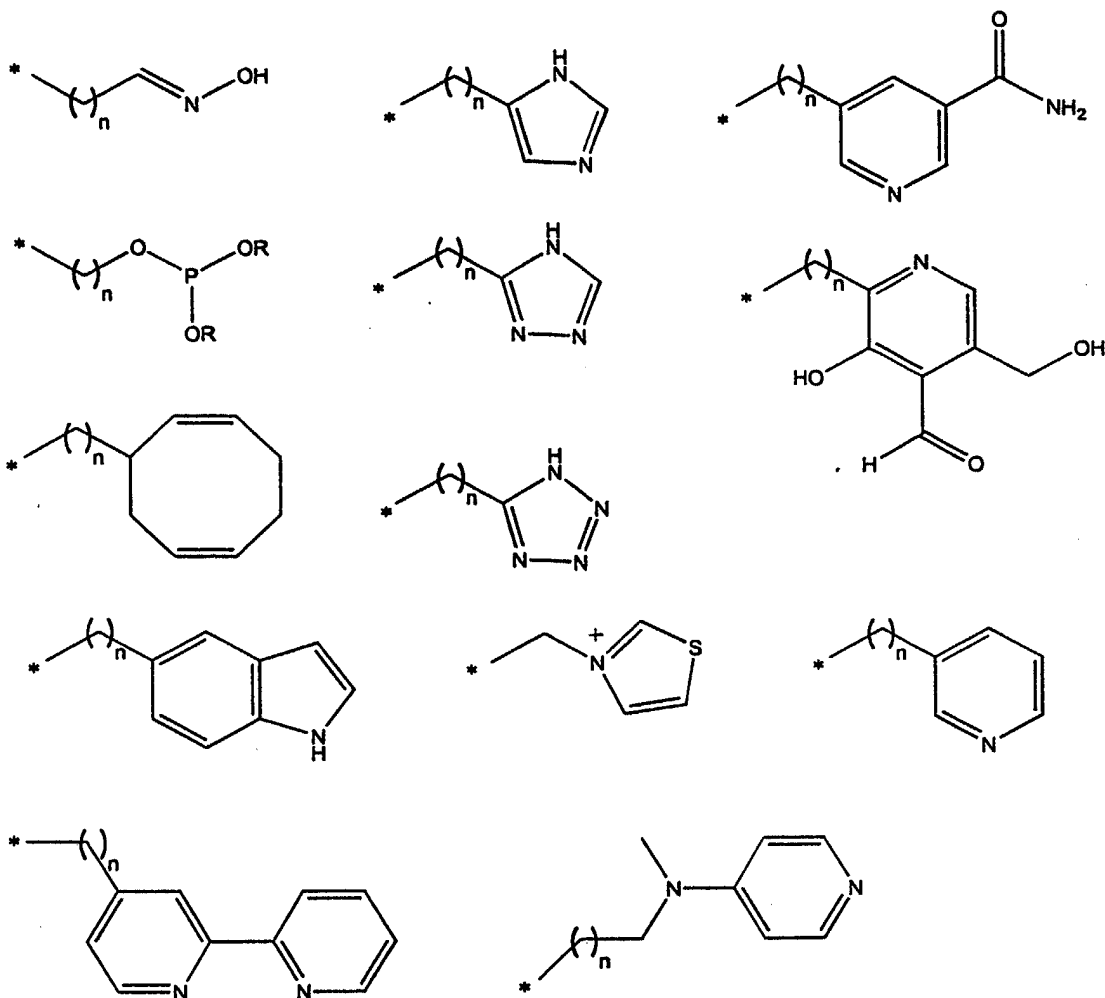


FIG. 20



wherein the asterisk indicates the point of attachment of the functional group to the nucleic acid, n may be any integer and wherein said functional groups may be substituted at aliphatic or aromatic positions;

(b) coupling each member of said nucleic acid test mixture with a first reactant to form a nucleic acid-first reactant test mixture;

(c) forming a product library by contacting said nucleic acid-first reactant test mixture with a mixture of free reactants consisting of small organic molecules with a molecular weight in the range of 2 to 1000, wherein said product library is formed as a result of a bond formation reaction between said first reactant and at least one of said free reactants, wherein said bond formation reaction is facilitated by a nucleic acid coupled to said first reactant;

(d) contacting the product library of step (c) with a target, wherein the product having the ability to perform a preselected function on said target relative to the product library may be partitioned from the remainder of the product library; and

5 (e) partitioning said product having said ability to perform a preselected function of said target from the remainder of the product library, whereby said product can be identified.

10 2. The method of claim 1 wherein said nucleic acid test mixture comprises nucleic acids having a region of conserved sequences and a region of randomized sequences.

3. The method of claim 1 wherein said nucleic acid coupled to said first reactant is selected from the group consisting of single-stranded RNA, single-stranded DNA and double-stranded DNA.

15 4. The method of claim 1 wherein said nucleic acid text mixture comprises pyrimidines modified at the 2'- or 5-positions.

20 5. The method of claim 1 wherein said functional group is on a ribose position of said nucleic acid.

6. The method of claim 1 wherein said functional group is on a base position of said nucleic acid.

25 7. The method of claim 1 wherein said functional group is on a phosphate position of said nucleic acid.

8. The method of claim 1 which further comprises a linker group coupled between said first reactant and said nucleic acid.

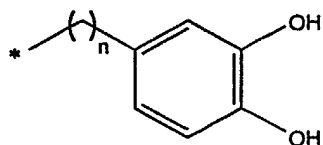
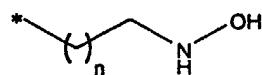
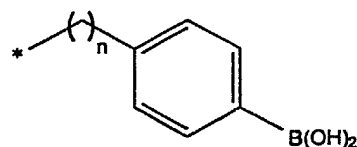
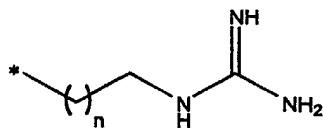
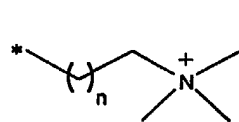
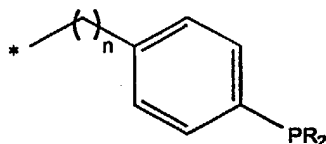
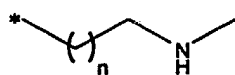
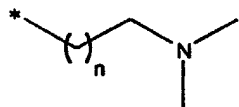
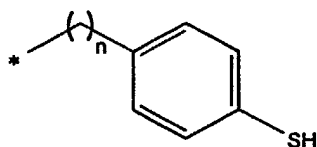
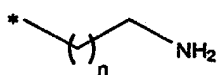
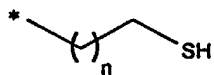
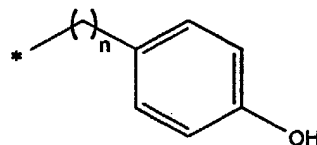
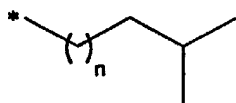
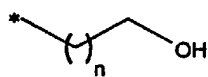
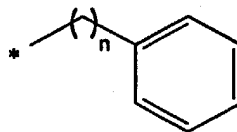
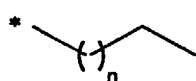
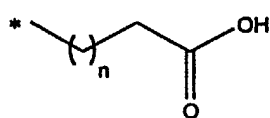
30 9. The method of claim 8 wherein said linker group has a size in the range of 10 to 1000 D.

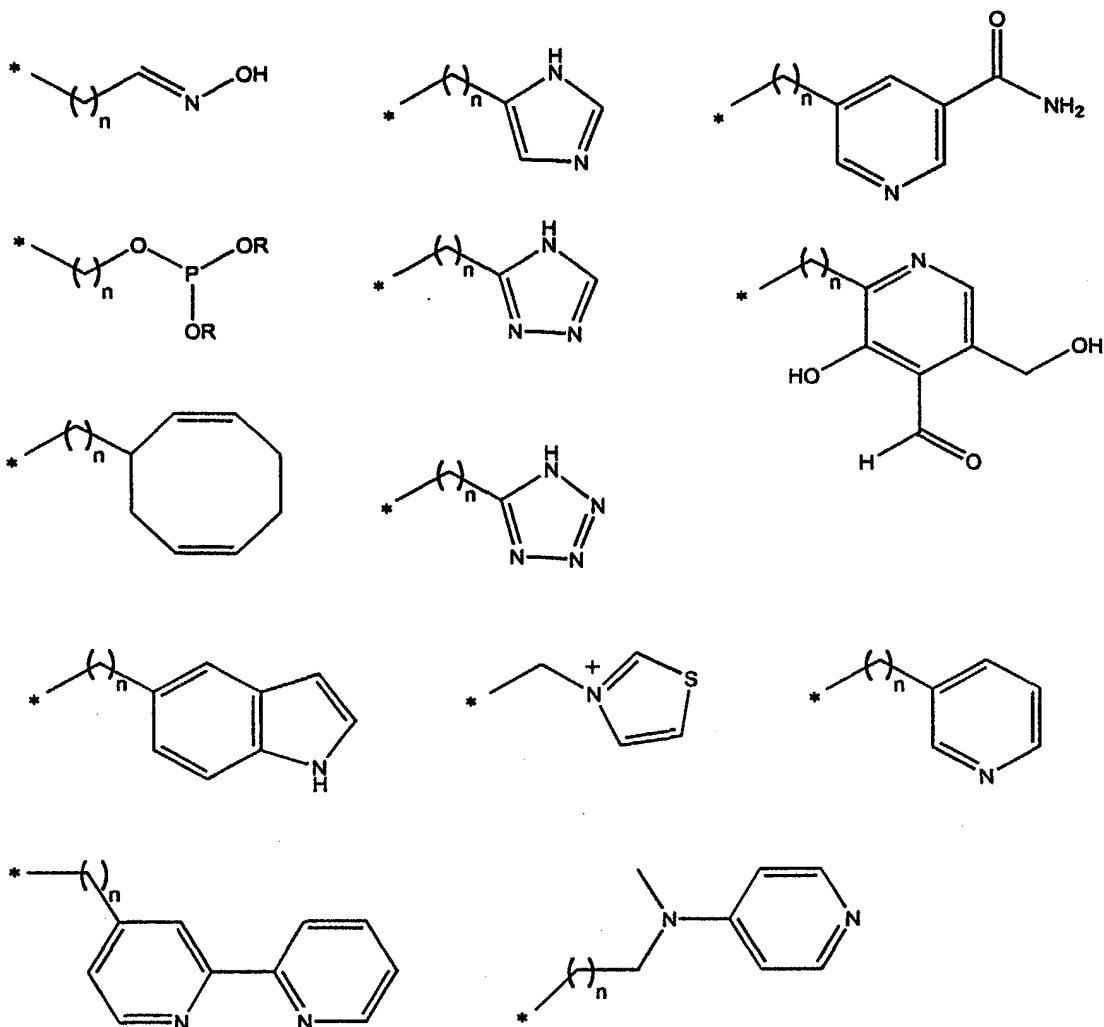
10. The method of claim 9 wherein said linker group is selected from the group consisting of PEG, polyvinyl alcohol, polyacrylates and polypeptides.

5 11. A method for coproducing a nucleic acid that facilitates bond formation and a product that performs a preselected function on a target comprising:

(a) preparing a nucleic acid test mixture preparing a nucleic acid test mixture, wherein said nucleic acid test mixture comprises nucleic acids having one or more functional groups selected from the group consisting of

10





5 wherein the asterisk indicates the point of attachment of the functional group to the nucleic acid, n may be any integer and wherein said functional groups may be substituted at aliphatic or aromatic positions;

(b) coupling a first reactant to each member of said nucleic acid test mixture to form a nucleic acid-first reactant test mixture;

10 (c) forming a product library by contacting said nucleic acid-first reactant test mixture with a mixture of free reactants consisting of small organic molecules with a molecular weight in the range of 2 to 1000, wherein said product library is formed as a result of a bond formation between said first reactant and at least one of said free reactants, wherein

said bond formation is facilitated by a nucleic acid which is coupled to said first reactant and wherein each product is coupled to a nucleic acid;

(d) contacting said product library with a target, wherein products that perform a preselected function on said target relative to the product library may be partitioned from the remainder of the product library; and

(e) amplifying the nucleic acid associated with the product that performs a preselected function on said target, to yield a mixture of nucleic acids enriched for nucleic acids that facilitate bond formation between said first reactant and said free reactant, whereby said nucleic acid that facilitates bond formation and said product are produced.

12. The method of Claim 11 which further comprises:

(f) coupling the amplified nucleic acids with said first reactant; and

(g) repeating steps (c) through (f) until the product that performs said preselected function on said target can be produced in sufficient quantity for structure determination.

13. The method of claim 11 wherein said nucleic acid test mixture comprises nucleic acids having a region of conserved sequences and a region of randomized sequences.

14. The method of claim 11 wherein said nucleic acid coupled to said first reactant is selected from the group consisting of single-stranded RNA, single-stranded DNA and double-stranded DNA.

15. The method of claim 11 wherein said functional group is on a ribose position of said nucleic acid.

16. The method of claim 11 wherein said functional group is on a base position of said nucleic acid.

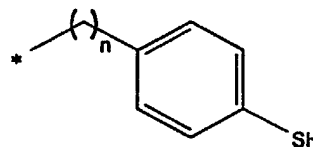
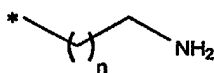
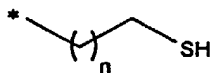
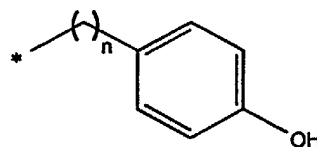
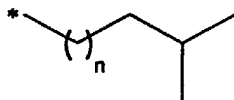
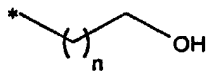
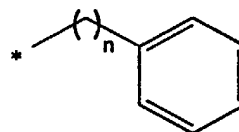
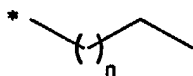
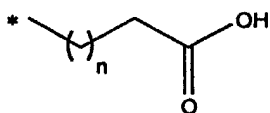
17. The method of claim 11 wherein said functional group is on a phosphate position of said nucleic acid.

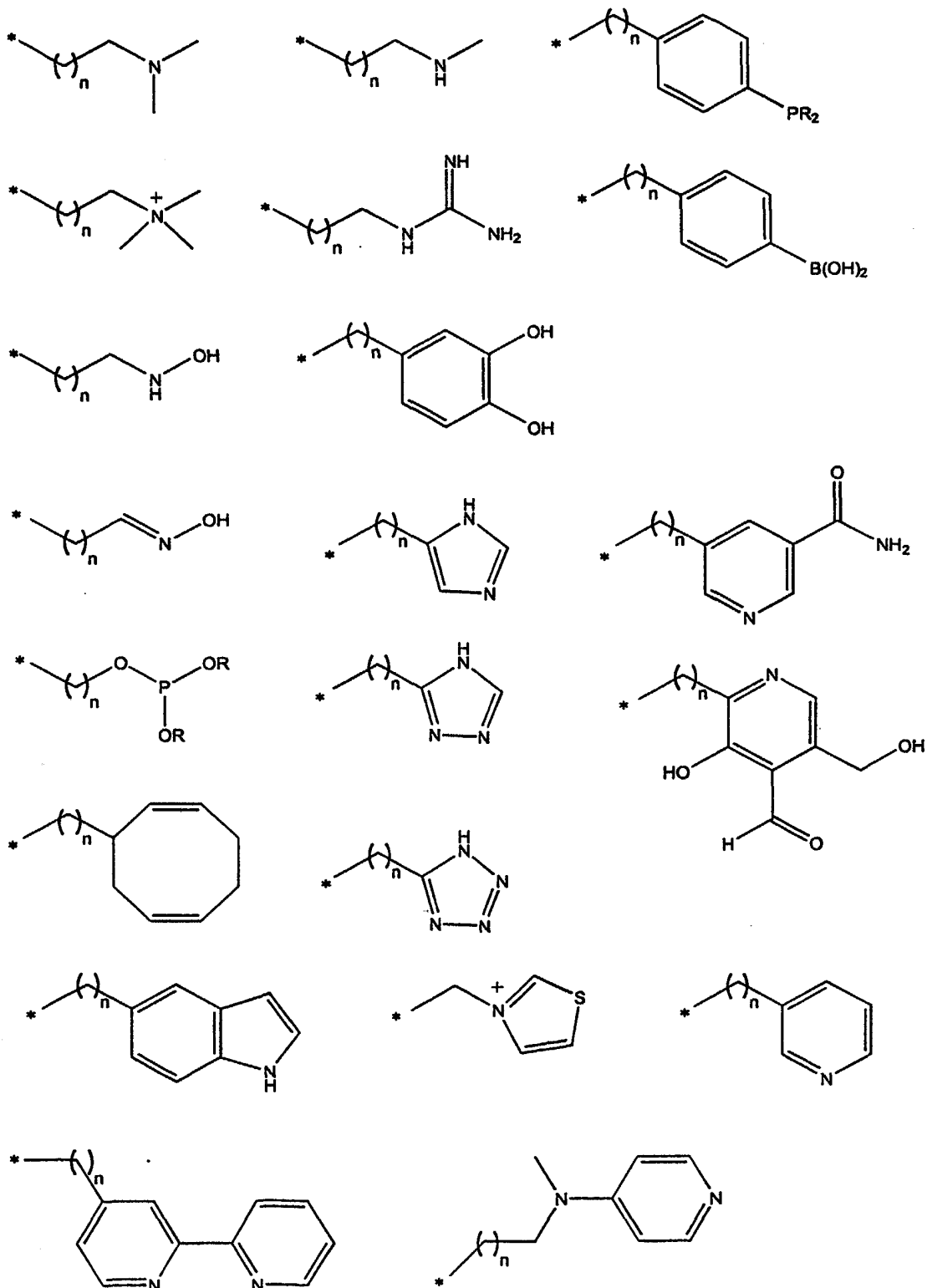
18. The method of claim 11 which further comprises a linker group coupled between said first reactant and said nucleic acid.

19. The method of claim 18 wherein said linker group has a size in the range of 10 to 1000 D.

20. The method of claim 19 wherein said linker group is selected from the group consisting of PEG, polyvinyl alcohol, polyacrylates and polypeptides.

21. A method for producing a product library comprising contacting a mixture of first reactants each coupled to a member of a nucleic acid test mixture with a mixture of free reactants, wherein said nucleic acid test mixture comprises nucleic acids having one or more functional groups selected from the group consisting of







wherein the asterisk indicates the point of attachment of the chemical group to the nucleic acid, n may be any integer and wherein said chemical groups may be substituted at aliphatic or aromatic positions, each of first and free reactants consisting of a small organic molecule with a molecular weight in the range of 2 to 1000, wherein said product library is formed as a  
5 result of a bond formation reaction between said first reactant and at least one of said free reactants, wherein said bond formation reaction is facilitated by the nucleic acid coupled to said first reactant.

22. The method of claim 21 wherein said functional group is on a ribose position  
10 of said nucleic acid.

23. The method of claim 21 wherein said functional group is on a base position of  
said nucleic acid.

24. The method of claim 21 wherein said functional group is on a phosphate  
15 position of said nucleic acid.

25. The method of claim 21 which further comprises a linker group coupled  
between said first reactant and said nucleic acid.

26. The method of claim 25 wherein said linker group has a size in the range of 10  
20 to 1000 D.

27. The method of claim 26 wherein said linker group is selected from the group  
25 consisting of PEG, polyvinyl alcohol, polyacrylates and polypeptides.